SECTION 15060
PIPE AND FITTINGS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Description of system:
   1. Pressurized piping.
   2. Nonpressurized piping.
   3. Accessories:
      a. Dielectric fittings.
      b. Unions.

1.2 QUALITY ASSURANCE

A. Pipe and fittings to be ASTM labeled for rating specified.

B. Welder qualifications: Certified under requirements of ANSI/ASME-B31.1 Power Piping.

1.3 SUBMITTALS

A. Project information:
   1. Manufacturer of listed products.
   2. Pre-insulated conduit piping system test reports.

PART 2 - PRODUCTS

2.1 GENERAL

A. Acceptable manufacturers:
   1. Fittings, mechanical groove-end and plain-end pipe:
      a. Base:
         1) Victaulic Company of America.
      b. Optional:
         1) Central Grooved Piping Products.
         2) Star Pipe Products.
   2. Dielectric waterway fittings:
      a. Base:
         1) Perfection Corp. Victaulic Company of America.
   3. Other manufacturers desiring approval comply with Document 00440.

2.2 PIPE

A. Black steel pipe:
   1. Seamless or welded steel pipe, ASTM-A53, standard weight unless otherwise indicated.
   2. For fire sprinkler service: ASTM-A135 and ASTM-A53, Grade-B, Schedule-40 or Schedule-10, Schedule-20, or Schedule-30 with minimum 0.25 IN wall thickness.

B. Galvanized steel pipe:
   1. Seamless or welded, hot-dipped galvanized steel pipe, ASTM-A53 or ASTM-B36/B36M.
   2. Joints:
      a. Threaded.
      b. Welded.
      c. Cut or rolled grooved.

C. Copper pipe:

1. Seamless copper tubing, ASTM-B88, Type-K, Type-L, or Type-M as indicated.
2. Joints:
   a. Soldered: Use ASTM-B32, 95 percent tin, 5 percent antimony solder, or Silvabrite 100.
   b. High temperature soldered: Use 1,000 degF solder.
   c. Roll grooved.

D. Cast iron soil pipe:
1. ASTM-A74.
2. Bell and spigot joints: Use oakum and lead, or neoprene gaskets (if allowed by code).
3. Gaskets: ASTM-C564.

E. No hub cast iron pipe:
1. CISPI 301 or ASTM A888.
2. Mechanical joints conforming to CISPI 310: Use stainless steel couplings with neoprene gaskets.
3. Gaskets: ASTM-C564.

2.3 FITTINGS AND COUPLINGS

A. Steel pipe fittings:
1. Socket welding fittings: ANSI/ASME-B16.11 and ASTM-A234/A234M.
2. Butt welding fittings: ANSI/ASME-B16.9, ANSI/ ASME-B16.25 and ASTM-A105.
3. Grooved fittings: Square cut, ASTM-A53 steel, or roll grooved, ASTM-A135.
4. Flanged fittings: ANSI/ASME-B16.5 and ASTM-A105.

B. Malleable iron pipe fittings:
1. Threaded fittings: ANSI/ASME-B1.20.1 and ANSI/ASME-B16.3, Class 150.
2. Threaded couplings: Same as threaded fittings except Class 300.
3. Grooved couplings: ASTM-A47, coupling segments with EPDM Grade-E gasket.
4. Galvanized malleable iron couplings: Victaulic; or ITT Grinnell.

C. Cast iron pipe fittings:
1. Drainage fittings: Coated or galvanized, ASTM-A74.
2. Threaded fittings: ANSI/ASME-B1.20.1 and ANSI/ASME-B16.4, Class 125.
3. Threaded drainage fittings: ANSI/ASME-B1.20.1, ANSI/ASME-B16.12 and ASTM-A126.
4. Flanged: ANSI/ASME-B16.1, Class 125.

D. Copper pipe fittings:
1. Wrought copper fittings: ANSI/ASME-B16.22.
2. Cast brass fittings: ANSI-B16.18.
3. Mechanical groove-end fittings: Factory roll grooved.
4. Flared tubing fittings: Use only on annealed pipe.
5. Cast flanged fittings: ANSI/ASME-B16.24, Class 150.

E. Dielectric fittings:
1. General:
   a. Standard product for prevention of galvanic corrosion.
2. Dielectric union:
   a. Ground-joint union with end connections of different material.
      1) End connection materials: Compatible with respective piping materials.
      2) Gasket and inert, non-corrosive thermoplastic sleeve shall electrically isolate end connections from each other.
3. Dielectric waterway fitting:
   a. ASTM-A53 Schedule-40, hot dip galvanized, steel pipe casing with inert, non-corrosive thermoplastic lining (NSF/FDA listed).
   b. Threaded or threaded X rolled grooved connections.
   c. Victaulic, "Clearflow".

F. Mechanical groove-end couplings and fittings:
1. Couplings:

a. Malleable iron, ASTM-A47 or ductile iron, ASTM-A536.
b. Gaskets: EPDM Grade-E conforming to ASTM-D2000 for water services up to 230 degF.
c. Gaskets on plastic piping: ASTM-F477.
d. Bolts and nuts: ASTM-A183.
1) Heat treated plated carbon steel, track-head.
2) Minimum tensile strength: 110,000 PSI.

2. Fittings:
a. Malleable iron, ASTM-A47 or ductile iron, ASTM-A536.
b. Copper:
1) 2 IN to 4 IN: ASTM-B75, C12200.
2) 5 IN to 6 IN: ASTM-B584, CDA 844 (81-3-7-9).

G. Unions.
1. Same type, pressure rating and material as piping.
2. Flanges: Raised face type of same type, pressure rating and material as piping.
3. Unions in copper pipe:
a. 2 IN and smaller: Use wrought copper solder joint copper to copper unions.
b. 2-1/2 IN and larger: Use brass flange unions.
4. Dielectric unions: See Dielectric fittings:

PART 3 - EXECUTION

3.1 GENERAL

A. Comply with ANSI/ASME-B31.9 for pressure piping installations.
1. Install piping without "bull-head" fittings.

B. Flush out water piping systems with clean water prior to adding treatment.

C. In general, make connections to components in piping systems with 3-elbow swing joints to allow for movement.
1. Movement includes but not limited to expansion, contraction, seismic, and equipment vibration isolation.

3.2 PIPING

A. Install piping parallel to building walls at such heights as not to obstruct portion of window, doorway, stairway, or passageway.
1. Where interference develops in field, offset or reroute piping as required to clear such interferences.
2. Consult Drawings for exact location of pipe spaces, ceiling heights, door and window openings or other architectural details and report discrepancies to the Government, before installing piping.

B. Pitch piping to drain:
1. Minimum pitch of 1 IN in 100 FT(except drainage piping).
2. Make piping and equipment drainable.
3. Accomplish pipe drainage using drain valves located on equipment and fixtures or separate drains.
4. Drains: See Section 15120.

C. Factory cut and thread nipples from seamless stock.
1. Use nipples of same material as pipe with which they are used.
2. Do not use close nipples except where such use is unavoidable.
3. Use Schedule-80 seamless pipe for close nipples and nipples of pipes 3/8 IN or smaller.

D. Provide backing and sleeves required in walls or floors for setting of fixtures or equipment.

E. Where transition occurs from sweated fittings (as at connection to fixture supplies, etc.), provide rigid anchorage so that no strain will be placed upon tubing.

3.3 JOINTS

A. Threaded joints:
   1. Cut piping carefully, ream, thread and work into place without springing.
   2. Use a small amount of prepared pipe thread lubricant on outside threads only.
   3. Provide in accordance with ANSI/ASME-B1.20.1.

B. Use dielectric waterway fittings for connections between dissimilar metals.

C. Flanged joints:
   1. Take care to ensure that there is no restraint on opposite end of pipe or fittings which would prevent uniform gasket compression or cause unnecessary stress in flanges.
   2. Keep one flange free to move in any direction while flange bolts are being tightened.
   3. Do not pack or assemble bell and spigot joints affected by flanged joints until such flanged joints have been tightened.
   4. Tighten bolts gradually and at a uniform rate, so that gasket compression is uniform over entire area of gasket.

D. Mechanical joints:
   1. Assemble in accordance with instructions and recommendations of pipe manufacturer.
   2. Clean joint surfaces and lubricate with soap solution or water soluble lubricant immediately before joint is assembled.
   3. Groove-end and plain-end joints:
      a. Use mechanical joint system only with pipe meeting joint manufacturer's requirements.
         1) When joint manufacturer's pipe requirements exceed specified requirements, provide pipe that meets joint manufacturer's requirements.
      b. Prepare pipe and install system in accordance with joint manufacturer's instructions and recommendations.

3.4 UNIONS

A. Provide a union between valves, at connection to each fixture, device or item of equipment, and elsewhere as required to facilitate installing, servicing, making up and disconnecting piping.
   1. Install each union to facilitate removal of parts, equipment or fixtures for inspection or cleaning.
   2. Install in a position which will permit device, fixture or part to be removed without disconnecting piping except unions.

B. Install unions as directed by Fluid Controls Institute (FCI).
   1. Grooved piping systems:
      a. Grooved type couplings may serve as unions.
   2. Make connections between couplings and flanged equipment with slip-on flanges and a grooved nipple, or groove-to-flange adapter.
   3. Welded piping systems:
      a. Where flanged end-service valves are used at equipment connections, flange unions will not be required.
      b. Make connections to flanged valves and equipment using ANSI welding neck or slip on type welding flanges.
      c. Flanged cast iron ells may be used for connections between pumps, strainers, check valves and other flanged equipment.

C. Install dielectric fitting at each piping joint and equipment connection between ferrous and non-ferrous materials.

3.5 PIPING EXPANSION

A. Install piping to allow thermal expansion and contraction without injury to piping, equipment or structure.
   1. Use loops or expansion joints where necessary and where detailed.
   2. Provide pipe guides at loops as indicated.

B. Where screwed piping is used for soil, waste or vent risers, or downspouts, use caulked joints or expansion joints at intervals to allow expansion movement.

3.6 WELDED STEEL PIPING

A. Where welded piping is specified, make welds by oxy-acetylene or electric process in accordance with ANSI/AWS-D10.12 and ANSI/AWWA-C206.
   1. Welding rods: Grade recommended for purpose by manufacturer; each rod stamped with manufacturer's name and identification.

B. Line welds:
   1. Single V-butt type.
   2. Mill or machine bevel pipe at 37.5 degrees to within 1/16 IN of inside wall, except that in field, limited amount of pipe may be flame beveled.
   3. Pipe with a wall thickness of 3/16 IN or less need not be beveled but may be welded by melting down into, and building up over abutting ends.
   4. Separate abutting ends of joints before welding to permit complete fusion to bottom without overlapping.
   5. Tack in 2 or more points to maintain alignment, and fusion weld.
   6. Weld continuously around pipe.

C. Make welds of sound weld metal, thoroughly fused into ends of pipe, and to bottom of vee.
   1. Build in excess of pipe wall to give reinforcement of 0.25 pipe wall thickness.
   2. Weld metal shall present a gradual increase in thickness from surface of pipe to center of weld.
   3. Minimum weld width: 2.5 times thickness of pipe wall.

D. Use welding ells at turns in welded lines except where pipe bends are indicated or are required for flexibility.

E. Mitered ells will not be permitted.

F. Do not weld pipe couplings in place of welding fittings for branch connections.

G. Weld-O-Lets and Thread-O-Lets:
   1. Scribe and cut openings in main pipes for welded branches accurately taking care to remove plug and cuttings from main pipe.
   2. Full weld fillet welds for full depth of fillet, with additional beads to form well rounded connection as recommended by Weld-O-Let manufacturer.
      a. Partially filled fillets not acceptable.

H. Cut openings into pipe for welded connections accurately to give carefully matched intersections.

I. Make welded fittings of same material with same pressure and temperature rating as pipe with which they are used.

J. Make flanged connections to control valves, pump suction, and specialties with ANSI standard welding neck flanges.
   1. Other flange connections may be made with slip-on flanges provided they are seal welded on inside.

K. Fuse fillet welds for flanges or fittings into pipe and plate for minimum distance of 1.5 times pipe wall thickness and depth of weld of 1.25 times pipe wall thickness.

3.7 THREADED STEEL PIPING

A. Branch connections to screwed piping may be made with Weld-O-Lets or Thread-O-Lets.

B. Do not weld pipe couplings in place of welding fittings for branch connections.

3.8 CAST IRON DRAINAGE PIPING

A. Lay underground pipe on undisturbed earth excavated to provide firm bearing on at least 0.333 of pipe circumference for full length, with bell holes cut out.
   1. Where excavation has been carried too deep, place a layer of sand well tamped to bring pipe to proper grade.
   2. Where fill or unsound earth is encountered, place a layer of 2500 PSI concrete to properly bed pipe.

B. Bell and spigot joints:
   1. Install neoprene gaskets in accordance with manufacturer's recommendations.
   2. Caulk tarred oakum well into joint and pour in molten lead continuously around joint, using at least 12 OZ of lead per IN of pipe diameter.
   3. Furnish sufficient lubricant to provide a thin coat on each spigot end.
   4. Use lubricant that is non-toxic, imparts no taste or odor to conveyed liquid, and has no deleterious effect on rubber gasket, with consistency so that it can be easily applied to pipe in hot or cold weather and will adhere to either wet or dry pipe.

C. Threaded joints:
   1. Clean cut, American National taper pipe threads.
   2. Ream pipe ends to full pipe size and remove burrs, chips, cuttings before making up.
   3. Pipe joint cement permitted on male threads only.

3.9 COPPER PIPING

A. Brazed (high temperature soldered) joints:
   1. Take care to avoid annealing of pipe material.
   2. For pipe sizes 2 IN and larger: Use a circular torch such as Circa Torch by Cedarberg Industries, for soldering joints.

B. Use lead-free solder.

C. T-drilling:
   1. Tapped pipe shall be least 1 IN diameter and branch shall be at least 2 pipe sizes smaller.
   2. Braze (high-temperature solder) joints.
   3. Branch pipe shall not protrude into main.

END OF SECTION